

Sanskrit as Computer Programming Language Structure for the Future - A Strong Case Review

¹Nandini Shukla, ²Dr. Gaurav Shukla

¹(B.TechC.S.E (SY)) Research Scholar, ²R&D Head,
¹Computer Science,

¹Shri Yugal Sharanji Maharaj Lupta Vigyaan Evam Swasthya Anusandhan Kendra, Meerut, India

Abstract— Language is a structured logical expression of thought, may be in sounds, gestures, arrangements or words spoken or written or otherwise. Every language is a logical system but every logical system is not a language. So what qualifies a logical system to become a language? Sanskrit Daivbhasha tradition is not new rather developed over centuries by diverse talents like thinkers, analysts, sculptors, grammarians and the like. The language traditions are very deep in the logical hearts of people of India for generations over several millennia, so much so that western world has also believing that the logical structure of Computer programming language can be matched with only Sanskrit. Almost all oriental languages have words from Sanskrit origin and very clear and logical structure based on Aastik philosophy which goes to the root of communication, i.e., the “thought” or “Idea” itself which is desired to be communicated. In 1985 Rickk Briggs highlighted comparison of Data Representation in Sanskrit and Artificial Intelligence. The discussion continued for decades that Sanskrit language could be one of best option for computers. Sanskrit is logical and clear with laws of its grammar but the present situation of both Computer programming and Sanskrit in present framework is not ready for Handshake for further development and expansion of the former. Sanskrit Vyakaran is based on only fourteen sutras called Mahesh war (Shiva) sutra, Grammarian Panini created 4000 sutras on which the system of modern day sanskrit is based. Computer as machine learning requires such language to perform better and faster with less programming. Sanskrit can play important role in making computer programming language flexible, logical and compact. This paper is focused on analysis of current status of research done on Sanskrit as a programming language the opportunity, scope and challenges.

Index Terms—Sanskrit, Language, Logic, Computer Programming, Computer, Natural Processing Language, Programming Language, AI- Artificial Intelligence

I. INTRODUCTION

Language starts from the domain of Creation of Idea though it is often understood as Exchange of Idea. Till the time we don't create an idea we don't need to exchange it with anyone. But this fact was never brought to us through any means of education. But in Vedic Language (VedBhasha) it always starts from Thought¹. This information was never important till the time cognition and neuroscience came into existence as a means for scientific exploration of man & machines. As Vedas were considered Religious books of Hindu religion with no relation with Science, this aspect remained buried. Hence, till now the dialogue was considered between 2 humans with different language origin and different language families were observed on that premise. Problem which emerged in last a few decades since 1980 was Dialogue between 2 persons with with the interface of machines. Thus we started to have Machine language, Artificial Intelligence and computer programming languages. In last few decades it was only computer language but now machine is equipped with intelligence. So a thinking structure is also needed for Machines. This created a huge Chaos as different languages have different language structures and none can be taken as a standard structure which could be applied over different language structures. Whether Sanskrit may form the base of a standard language structure which may be applied on all languages Human or Machine is our subject of study. In other words whether standard language structure applicable both to human and machine language may be based on or developed through Sanskrit as Vedas - Tantra - Tarka texts in Sanskrit has the key to all. Specially Tantra (System) have all three components for machine communication, i.e., Tantra (Sytems)+ Mantra(softwares) + Yantra (machines) all three integrated or knit into one. However, this process also needs many clarifications as the commentaries done by many have really confused the audience. Our effort in this paper is to remove those confusions and to create a meaningful system where everything is defined.

Aims and Objectives:

To review the literature related to the concept of structure of Sanskrit language which can be easily moulded into Computer Programming Language. The objectives of this research paper are twofold, i.e., to dig out the ancient knowledge about Sanskrit and its connection with Computer Programming Logic that is used in translation over different Languages and to reduce (or minimize) the confusion about the meaning and connotation of origin of Logic of Language.

Methodology:

Reviews of Vedas , Vyakaran & Tarka texts, electronic data base, and published researches have been carried out. Collection, compilation and deep analysis of the concept have been done.

Review of Literature:

A language is a structured system of communication. John Peters argues that the difficulty of defining communication emerges from the fact that communication is both a universal phenomenon (because everyone communicates) and a specific discipline of institutional academic studyⁱⁱ. Language was mostly considered as exchange of thoughts between two or more, but how can we exchange thoughts without even having created them. So, Language starts from creation of thoughts to exchange of thoughts

between two. Now this two is One or Many. "An apparent answer to the painful divisions between self and other, private and public, and inner thought and outer world."ⁱⁱⁱ Sanskrit text starts from Vedas^{iv}, Tantra and Tarka. The term Veda originated from 4 rootwords 1. Vid (Gyaan-Relationship) 2. Vid (satta-Properties) 3. Vid (labh-Action) 4. Vid (vichar-Object). So whatever encompasses Object, Properties, Action and Relation is part of a Language. In fact we have 8 parts of Speech in the English language originating from these 4 rootwords. But with the advent of computers a need was felt for computer programming language whose structure can be connected with any natural language processing. The only language that fits into this structured approach where everything is defined and also possesses a cause for creation is Sanskrit Daiv Bhasha.

Since Sanskrit is almost negligibly used by common people in present India, a need is felt to highlight the scientific scope of this language. This highlighting of scope will help reducing the chaos in the computer language industry where everyone is clamouring for the supremacy of a language environment. The initial question is: If we create Sanskrit as Programming language how its structure helps bridging the gap in the Proto Language Market. In the tree model of historical linguistics, a **proto-language** is a postulated ancestral language from which a number of attested languages are believed to have descended by evolution, forming a language family. **Proto-languages are usually unattested, or in some cases only partially attested.** They are reconstructed by way of the comparative method.^v

Sanskrit or DaivBhasha is the only language on the globe which uses a structure from Creation of Universe to destruction of Universe and again to Creation.^{vi} The Tantra Granth^{vii} describes this in detail. There are 3 major parts to total hindu text primarily described in Sanskrit; 1.Veda (Thought) 2.Tantra (Sound) 3.Tarka (Logic). These 3 are fundamentally derived from the Aastik Darshan of the 2 Schools of Philosophy Aastik (belief in creator of Universe - Yes) and Nastik(Belief in creator of Universe -No). So binary logic is attached with every step. Sanskrit as language originates from Vedas+Tantra as Creation of Thought determines Vedas and Creation of Sound determines Tantra (the two binary positives). There are 6 parts of Vedas called Vedanga^{viii}(6 Parts of Language of Thought) 1.Shiksha (Phonetics) 2. Kalpa (Time - Ritual Canon) 3. Vyakaran (Grammar-Rules) 4. Chhanda (Rhythm-Tempo) 5. Nirukta (Original Etymology) and 6. Jyotish (Astrology- Assigning Name, Properties & Action). This gives us a realization that if each part of Sanskrit is rewritten and compared with a Computer language Binary code or Trinary code for quantum computing it can be better understood by many students as the logical structure of Natural language Processing is missing while someone studies a computer language. Thus teaching sanskrit to every student in school and later transition to computers will be very fast, smooth and logical.

Logic of Language Sanskrit is covered under each step - Veda, Tantra, and Tarka texts. Tarkashastra is specially designed for highlighting of the Logic system. Every language is a Logical system but every logical system is not a language. Thus what makes a logical system a language highlights important facts about language. Till the time this logic is not established the language is never considered to be complete. Sanskrit Language starts from Creation of Thought which we express into Sign, Sound and form. All three are controlled by time.

As per Kathak Darpan the concept of Taal^{ix} highlights the importance of a standard which brings uniformity and it is uncontrollable by any means. For example, Sangeet(Music) is a thought but it is expressed by Dance (Sign Language), Vocal music(Sound), Instrumental Music(Lipi) and all three are controlled by Taal (The domain of Time- Tempo). Standards of Taal are like that of Grammar and 10 elements of Taal bring Praan^x (Life) into Sangeet (music). This Taal generates Ras^{xi}(Not taste but 9 Emotions) and this Ras generates Bhaav^{xii}(Expression) which impacts all the 9 chakras which are connected with 9 elements Mann, Aatma, Time, Direction, Sky, Air, Fire, Water and Earth. The logical approach is that Taal possesses Pran which duo generate Ras(emotion) that generates Swar. Swar in different variations of Compositions becomes Raag. This raag has different points or area of impact over the human body which is the basis of Gram(not a measure of weight). The sentences of Music are known as Chhand. All these different combinations of Swar Gram, Murchana, Chhand, Taal are the 5 elements of Sangeet(Music). This Sangeet variation triggers Bhaav. Which is exchanged by two(Inside One or Many) and thus Communication starts. So this simple construct of Sangeet is to be treated as a Language as it possesses Shiksha, Kalpa, Vyakaran, Chand, Nirukta, Jyotish. This bhaav bridges communication between two(which can be one or many). In Music, we have a technical term Sangeet, which is expressed in three forms Vocal(Creator), Dance(software) and Instrument(hardware). Each part is standardised on the basis of Taal. Taal possesses Pran and thus generates Ras(emotion) generates Swar, Swar in different variations of Compositions becomes Raag. This raag has different places of impact inside the body which is the basis of Gram. The sentences of Music are known as Chhand. All these different combination of Swar Gram, Murchana^{xiii}(Sapta swaron ka Aaroh Avroh kram,, Moh) Chand, Taal are the 5 elements of Sangeet(Music). This Sangeet variation triggers Bhaav. Which is exchanged by two(Inside One or Many) and thus Communication starts. So this simple construct of Sangeet is to be treated as a Language as it possesses Shiksha, Kalpa, Vyakaran, Chhand, Nirukta, Jyotish.

After looking at the above logical structure of music we can now say that since we have all 6 components viz., Shiksha (Yes), Kalp (Time - Taal-Yes) Vyakaran (Rules- Yes), Chhanda (Musical Composition - Yes) Nirukta (Original Etymology - Yes) Jyotish (assigning Object Properties and Action to each part - Yes) Sangeet(Music) is not a merely a thought, it is a Language.

Similarly we can say Aayurveda (Medicine), GandharvaVeda (Music), Dhanurveda (Engineering), Arthashastra (Geopolity Economy) all the four are languages as they originate from the philosophy of Vedanga and possess 6 parts. Like father like son.

Thus, a Language is something that is much more than communication or alphabets pronunciation and it should be tested on the touchstone whether its essential elements are still missing. Vedas are also known as Veda Bhasha or Daiv Bhasha and Vedaanga^{xiv} are treated as 6 Parts of Veda Bhasha. Veda is considered to be thought and Vedabhasha is Language of thought or Daiv Bhasha which is Communication with the Creator. Thought is the fundamental area where whole of 7+ Billion people unite. Every Living being possesses a Thought. So principles of Language of Thought are lying in Veda+Tantra+Tarka as prescribed in our ancient Texts. Hence, if a Universal language is developed using Sanskrit, a uniform structure can be built providing support to Multilingualism badly needed for machine language. If we use a standard base where one logical language system is implemented, Learning a Language would become much easier.

Applying the same system on Machines any kind of Machine working on digital language can work more efficiently for Data interface.

Comments on comparison between Computer Language and Sanskrit:

1. Present computer language is based on binary code whereas Sanskrit Daivbhasha originates from ternary code^{xv} with three parameters 1,0,R. R is a function of Resonance with 1 & 0 in Sanskrit it is known as Sat, Raj and Tam or Shiv, Shakti and Naad.

2. In 1985, NASA scientist Rick Briggs had published a research paper in which he argued that the 3,500-year-old language was the best candidate for programming artificial intelligence technology – namely because of its adherence to rigid grammatical rules.

3. **Paul Thomas**^{xvi}, a fourth-year undergraduate student at St. Michael's College who plans on majoring in computer science next year, says he has a proclivity for learning languages, but ultimately took the course because of its connection to coding. "Sanskrit is a very computational language," he explains. "It's a lot of syntax, which is the structure of programming itself. Classical Sanskrit is an engineered language."

4. The difference is that traditional Sanskrit grammar is comprised of *sutras* — terse formulas that act in conjunction with one another to comprise complex rule systems. And while all *sutras* share this characteristic of being able to convey deep meaning in short words, I would argue that Panini's grammar sutras (called "*Ashtadhyayi*") are even more compact and mathematically dense than any other set of sutras^{xvii}.

5. The book *Comprehensive English Grammar* is roughly 2000 pages and weighs 5 lbs, while Panini's grammar sutras are about **1% of that** — about 20 pages. Although it is said that brevity is the soul of wit, Panini had other reasons to keep it short. The lack of printing and distribution of books meant that the texts had to be passed down orally and recited. Try reciting a 2000 page text by heart and applying it in communication! So, something had to be done to condense those rules into a format that could be memorized and recited. Thus, sutras were developed.^{xviii}

6. The Sanskrit Series^{xix}

1. Features of Sanskrit that make it an extra-ordinary language
2. Mechanism of generating new words in Sanskrit (extrapolation and expansion), a virtue for any language
3. Similarities between Sanskrit and Programming Languages
4. Verb less sentences in Sanskrit
5. The building blocks of Sanskrit language
6. No punctuation in Sanskrit!!
7. The flexibility of Sanskrit
8. Efficiency of Sanskrit: more meaning in fewer words!
9. Temporal order of words in Sanskrit

7. Walter Eugene Clark^{xx}, Professor of Sanskrit at Harvard University, who translated Aryabhatta's *Aryabhatiya* into English, wrote that "Panini's grammar is the earliest scientific grammar in the world, and one of the greatest." He said the "Indian study of language was as objective as the dissection of the body by an anatomist."

Discussion:

Why this study is Important? Rickbriggs wrote something about Artificial Intelligence and Logic of Sanskrit in 1985, In those days Computers were just accounting machines. Now there is a beautiful side attached to it, using Sanskrit more and more its logic^{xxi} increases intelligence of the Masses and thus makes the system Meaningful.

Points in favor of this topic:

- 1: Supports Multilingualism develops Learning Environment.
- 2: Simple to adapt and can be integrated with all knowledge streams.
- 3: Saves Memory space on Active Memory Meaningful Information basis. Saving memory space means saving memory cost
- 4: Can be applied on Quantum Computing and any kind of Future Tech friendly application.
- 5: Supports integration of Knowledge of the world to the Universe/Multiverse.
- 6: Generates meaningful Information and develops purpose centric approach.
- 7: Being Meaningful information develops ethical system with gratitude.
- 8: Logic of language develops logical and wishful developers.
- 9: Multi subject exposure which makes everything Economical to Use and sustain.

Points not in favor of this topic:

- 1: Additional bandwidth is required for learning in terms of Time, Money and energy.
- 2: Needs to be implemented on School level for best results. However, the new generation has fast adapted to computer use and language and the transition would not be more painful.
- 3: Ethical value is always questionable
- 4: Opening logic gates develops questioning ability.

So looking at these analogies we can say Machine Language is communication between Creator and Creation.

Though a lot of work needs to be done but this highlights an important information for bridging computer artificial intelligence and Sanskrit. Aim of study is to create a roadmap for computer programming using sanskrit as natural language processing thus a fixed logical structure can be understood. A number of studies show that only 40% work has been done in this field. There was a paper by Rick Briggs that makes a case that natural languages are not that difficult to use for computer programming. He cites Sanskrit as an example as its grammar can be easily translated to a form understandable by a computer^{xxii}.

Conclusion:

Any Language is an expression of words , words are composed of alphabets and alphabets possesses a pronunciation.....that is it. This can be true for almost all the languages of the world but for Indian Languages, Language itself is a Philosophy. Such detailed thinking processes, logical explanation for each and every alphabet. Such wonderful logical construct of Alphabet, Words and rules for Sentences. Sanskrit or Daiv Bhasha has a logical construct and it starts from Creation of Thought. This thought is further expressed in the form of Signs, Sounds and Written forms called Lipi. Standardisation of all three in sync is the very basis of any Language. For any logical system to be a language it must possess Shiksha, Kalpa, Vyakaran, Chhand, Nirukta, Jyotish is the very basis of Sanskrit Daiv Bhasha. But lot of labour is required for making Computer programming language, Artificial Intelligence and Machine learning at par with Sanskrit. Both the domains are almost ready for mapping; work is required for both sides for a handshake. More work is required in the field of Computer working where as Sanskrit is almost 90-95% ready for a logical structure.

REFERENCES

1. ⁱDr Rajbali Pandey, Hindu DharmaKosh, 3rd Reprint, 2003 Veda Pg 596
2. ⁱⁱ Peters, John Durham (1986). "Institutional Sources of Intellectual Poverty in Communication Research".
3. ⁱⁱⁱ Peters, John Durham (1999). *Speaking into the air : a history of the idea of communication*. Chicago: University of Chicago Press. p. 2. ISBN 0-226-66276-4. OCLC 40452957.
4. ^{iv} Dr Rajbali Pandey, Hindu DharmaKosh, 3rd Reprint, 2003 Veda Pg 596
5. ^v Campbell, Lyle (2007). *Glossary of Historical Linguistics*. Edinburgh University Press. pp. 158–159. ISBN 978-0-7486-3019-6.
6. ^{vi} Dr Rajbali Pandey, Hindu DharmaKosh, 3rd Reprint, 2003 Nasadiya Sukta Pg 364
7. ^{vii} Dr Rajbali Pandey, Hindu DharmaKosh, 3rd Reprint, 2003 Tantra Pg 292
8. ^{viii} Mithun Howladar. Importance of the Vedangas: An Analysis, IRJIMS. 2016;II(IX):77-85.
9. ^{ix} Teerathram Azad, Kathak Darpan, 3rd Edition,2020 Natashwar Kala Mandir Pg 236
10. ^x Teerathram Azad, Kathak Darpan, 3rd Edition,2020 Natashwar Kala Mandir Pg 237
11. ^{xi} Teerathram Azad, Kathak Darpan, 3rd Edition,2020 Natashwar Kala Mandir Pg 83
12. ^{xii} Teerathram Azad, Kathak Darpan, 3rd Edition,2020 Natashwar Kala Mandir Pg 85
13. ^{xiii} Dr.Parasnath Dwivedi, Acharya Nandikeshwar aur unka Sahitya,Samp.San.Vidyalaya,Varanasi,1989 Pg 323
14. ^{xiv} Dr Rajbali Pandey, Hindu DharmaKosh, 3rd Reprint, 2003 Vedaanga Pg 603
15. ^{xv} Colin P. Williams (2011). *Explorations in Quantum Computing*. Springer. pp. 22–23. ISBN 978-1-84628-887-6.
16. ^{xvi} <https://www.utoronto.ca/news/it-s-good-coding-computer-science-students-drawn-classes-sanskrit-3500-year-old-language>
17. ^{xvii} <https://medium.com/@tomgoldenberg/sanskrit-the-first-programming-language-d8647753217f>
18. ^{xviii} [://medium.com/@tomgoldenberg/sanskrit-the-first-programming-language-d8647753217f](https://medium.com/@tomgoldenberg/sanskrit-the-first-programming-language-d8647753217f)
19. ^{xix} <https://uttishthabharata.wordpress.com/2011/05/30/sanskrit-programming/>
20. ^{xx} <https://www.thehindu.com/features/friday-review/where-sanskrit-meets-computer-science/article7061379.ece>
21. ^{xxi} https://www.researchgate.net/publication/274991188_Effects_of_Sanskrit_Schooling_on_Cognitive_and_Social_Processes
22. ^{xxii} <https://ojs.aaai.org/index.php/aimagazine/article/view/466>, Rick Brigs